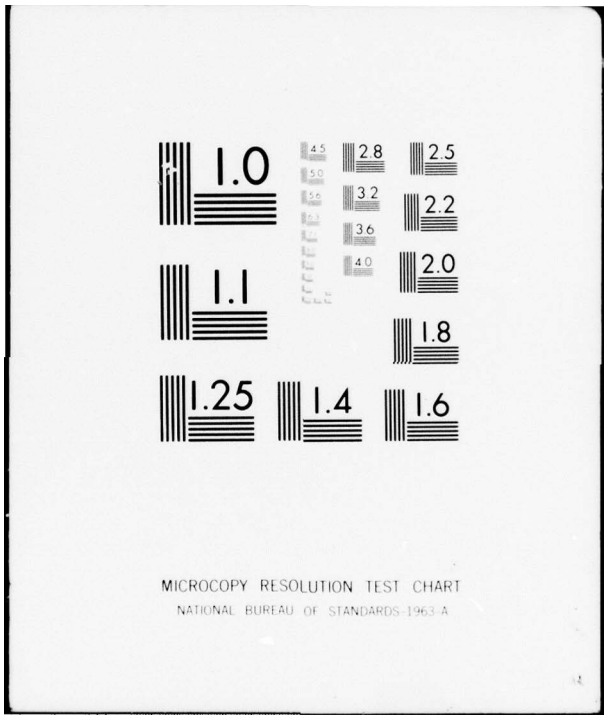
AD-A040 863 RAND CORP SANTA MONICA CALIF F/G 6/5
THE IMPACT OF THE NEW MEXICO EXPERIMENTAL MEDICAL CARE REVIEW O--ETC(U)
DEC 76 R H BROOK, K N WILLIAMS

UNCLASSIFIED P-5761 NL

1 OF 1
AD A040863

END

DATE FILMED
7-77


1.0
1.1
1.25
1.4
1.6
1.8
2.0
2.2
2.5
2.8
3.2
3.6
4.0
4.5
5.0
5.6
MICROCOPY RESOLUTION TEST CHART
NATIONAL BUREAU OF STANDARDS-1963-A

(2)

B. S.

THE IMPACT OF THE NEW MEXICO EXPERIMENTAL MEDICAL CARE REVIEW ORGANIZATION ON THE QUALITY OF THE USE OF INJECTIONS.

(10) Robert H. Brook
Kathleen N. Williams

(11) December 1976

(12) 32 p.

(14) P-5761

The Rand Paper Series

Papers are issued by The Rand Corporation as a service to its professional staff. Their purpose is to facilitate the exchange of ideas among those who share the author's research interests; Papers are not reports prepared in fulfillment of Rand's contracts or grants. Views expressed in a Paper are the author's own, and are not necessarily shared by Rand or its research sponsors.

The Rand Corporation
Santa Monica, California 90406

THE IMPACT OF THE NEW MEXICO EXPERIMENTAL MEDICAL CARE REVIEW ORGANIZATION ON THE QUALITY OF THE USE OF INJECTIONS

Robert H. Brook and Kathleen N. Williams

SUMMARY

Evaluation of the impact of formal peer review of the New Mexico Medicaid program during its first two years of operation demonstrated that peer review can affect the level of quality of care provided.

Use of injections dropped by over 60 percent. Major decreases occurred in the use of antibiotics (e.g., lincomycin, tetracycline, and short-acting penicillin); certain steroids; and antispasmodics. Analysis of the relationship between physician characteristics and the proper use of injections demonstrated the following: (1) being a member of a group practice that billed under its own name was the variable most significantly associated with the proper use of injections; (2) for physicians billing under their own names, being board-certified was the principal predictor of higher quality care; (3) provider type (being an MD rather than a DO) and specialty were also significant predictors of quality; (4) foreign medical graduates did not give substantially worse care than did U.S. graduates; and (5) the 6 percent of physicians who gave 40 percent of the medically unnecessary injections changed their behavior dramatically for the better.

ACKNOWLEDGMENTS

The authors wish to acknowledge the creative leadership of the following persons in New Mexico whose efforts led to the peer review activities which are evaluated in this paper: Dr. George Boyden, Principal Investigator of the New Mexico Experimental Medical Care Review Organization grant; Mr. Richard Heim, director of New Mexico's Department of Health and Social Services; Mr. Robert Flanagan and Mr. Wesley Curtis of the Dikewood Corporation. Ms. Davy Atelsek and Dr. Feather Hair, of the National Center for Health Services Research, also deserve recognition for their support in facilitating this evaluation. Our appreciation is also extended to Dr. John Rolph and Dr. Charles Phelps for their assistance with the statistical analyses.

The research reported herein was supported in part by a Health Insurance Grant from the U.S. Department of Health, Education, and Welfare and a contract from Health Care Management Systems. The opinions and conclusions expressed herein are solely those of the authors and should not be construed as representing the opinions or policies of the supporting agencies.

A similar version of this paper appeared in *The Annals of Internal Medicine*, 85:509-514, October 1976.

I. INTRODUCTION

Efforts to improve the quality of medical care are here to stay. No longer are they confined to the theorist; instead, they are mandated by two federal laws (1,2) and one national professional organization, the Joint Commission on Accreditation of Hospitals (3). When fully operational, quality assurance activities are likely to consume 2 to 5 percent of all medical care expenditures, or $2 to 5 billion annually.

Little is known about the effectiveness of these activities. The amount of rhetoric addressed to this question is enormous (4-8); the amount of data is negligible. For instance, most studies of PSRO-like organizations have been concerned with their effect on cost variables (e.g., cost of hospital care), not on quality variables (9-11). One study examined the effect of the San Joaquin Foundation for Medical Care on the utilization of ambulatory services; it showed small but significant improvements (12). In general, although the PSRO program is being vigorously implemented, information about the impact that PSRO or PSRO-like organizations have had or will have on the quality of care is virtually nonexistent.

The purpose of this paper is twofold: 1) to describe the impact of the New Mexico Experimental Medical Care Review Organization (a PSRO prototype) on the quality of the use of injections as judged by medical criteria; and 2) to relate the proper or improper use of injections as judged by medical criteria to the following physician characteristics: osteopathic or medical doctor, age, practice in urban or rural location, specialty, specialty board certification status, and foreign or U.S. medical graduate.

II. METHODS

The Setting

The history of the New Mexico Experimental Medical Care Review Organization (EMCRO) has been extensively documented (13-16). In 1971 three groups (the Health and Social Services Department of the State of New Mexico, the New Mexico Foundation for Medical Care, and the Dikewood Corporation) joined together to develop a system for processing claims for the State's Medicaid program and for reviewing the quality of the services rendered within that program.

Claims for medical services rendered are submitted by the physician to the Dikewood Corporation (the fiscal intermediary for the Medicaid program), where they are entered into a data bank and screened on the basis of administrative criteria to determine whether they are valid. Clerical reviewers (employees of the New Mexico Foundation for Medical Care) then access the information contained on these claims and compare it with medical guidelines established by EMCRO physicians. (A copy of these guidelines is available elsewhere [17].)

If a claim passes the review, it is returned to the routine processing system for payment. If a claim fails this review, it is held for review by a practicing physician who decides whether the claim should be paid or denied for medical reasons. If the claim is denied, the provider may appeal the decision of the reviewing physician.

The Population

This study is concerned with the quality of care given to the New Mexico Medicaid population between September 1, 1971 (when peer review began) and August 31, 1973. An average of 74,059 people were enrolled in the Medicaid program in each of the 24 months covered by this study. Sixty percent of the population remained in the program for the entire two years. Seventy-five percent of the population was covered under the Aid to Families with Dependent Children (AFDC) category. Of the remainder, the majority were in the categories of Old Age Assistance or Aid to the Partially and Totally Disabled; relatively few were in the Aid to the Needy Blind category.

Almost one-half of the population was 14 years of age or younger; another quarter was between 15 and 44 years of age; the remainder was split almost evenly between ages 45 through 64 and 65 and older. Women comprised almost 60 percent of the entire population. The population was primarily white (81 percent); the next largest group was Indian (14 percent); blacks and other ethnic groups made up 5 percent of the total. One-third of the population lived in Bernalillo County (which includes Albuquerque); the remainder were distributed throughout the state with no other county having more than 6 percent of the Medicaid population.

Study Design

In order to perform the dual objectives of this study, a data tape was obtained from the New Mexico EMCRO that made it possible to link the date of an ambulatory visit with provider characteristics, specific information about ambulatory utilization, and facts about quality of care (such as whether an injection was given and whether it was denied for medical reasons). Physicians in New Mexico can bill under either their own provider number or a group number. Information about age, board certification status, medical school of graduation, specialty, and practice location was obtained from each provider who billed under his own number and who delivered 100 or more ambulatory visits (home, office, emergency department and/or outpatient department) in the two-year study period.

To assess the impact of the New Mexico EMCRO on the use of injections, a controlled time-series design was used. Controls were the number of prescriptions and/or laboratory tests given per Medicaid eligible per month, since virtually no review for the medical necessity of these services was made. To test the relationship between the proper use of injections and physician characteristics, contingency table analyses were performed. (The multivariate analysis supports the conclusions of the contingency table analysis and is available from the authors [17].)

To determine the relationship between physician characteristics and the proper use of injections, a data set was constructed of the

ambulatory care given by physicians who had provided 100 or more ambulatory visits in the two-year study period. The 360 providers who met this criterion provided 95 percent of the ambulatory visits and 94 percent of the injections. (Eleven percent of all injections could not be attributed to any one provider.) Of these 360 providers, 47 were "group providers" and billed under a group name. Of the 313 physicians who billed under their own names, 81 were Doctors of Osteopathy (DOs), and 232 were Doctors of Medicine (MDs). Additional information was obtained from these physicians: age from 295 (94 percent), county of practice from 308 (98 percent), board certification status from 292 (93 percent), and specialty from 309 (99 percent). For the 232 MDs, data on school (country) from which they graduated were obtained on 208 (90 percent). Missing data were usually associated with a physician who had died or moved out of state and thus had provided relatively few services.

Three dependent variables were constructed: 1) the number of injections billed per ambulatory visit; 2) the number of injections denied per ambulatory visit; and 3) the number of injections denied per number of injections billed. Variable 1 reflects the propensity of a physician to use injections (many of which were medically unnecessary). It also measures the effect that the peer review process had on the use of injections. Variable 2 reflects the likelihood of a patient's receiving an injection judged to be medically unnecessary. Variable 3 measures the sanction effect of the peer review system.

III. RESULTS

Injections Billed and Denied for Medical Reasons

General Description. Over 95,500 ambulatory injections were given during the course of the study; of these nearly 50 percent were antibiotics (Table 1). During the study period, there were 1,777,404 patient eligible months and 334,608 ambulatory visits. Thus, 0.65 injections were billed per eligible per year; of these, 0.19 injections were denied per eligible per year. On the average, 0.29 injections were given per ambulatory visit, and 0.08 were denied.

Over 27,600 injections (29 percent of those billed) were denied for medical reasons (Table 1). Of these, 98 percent were denied for the following two reasons: type of injection (93 percent) did not appear warranted from the information on the claim, and the frequency of injection (5 percent) did not appear warranted from information on the claim.

Changes Over the Study Period. The New Mexico EMCRO began reviewing the use of injections against medical guidelines in September 1971; during the period September 1971 to January 1972, however, little peer review activity was accomplished, and injection usage was high. During each of these early months, about 9 percent of those patients eligible for the Medicaid program received one injection (Figure 1); about 40 percent of all ambulatory visits ended with an injection (Figure 2). In January 1972, members of the EMCRO staff implemented educational activities consisting of discussions with small groups of physicians who were using injections inappropriately and in May 1972, formal guidelines concerning the proper use of injectables were distributed, published, and used in reviewing claims.

The effect of these two actions was immediately apparent. The number of injections billed (Figures 1 and 2) fell substantially after January 1972, and the percent of the number of injections denied per injection billed (Figure 3) dramatically increased after May 1972.

FIG. 1

NUMBER OF ALL INJECTIONS BILLED, PAID, AND DENIED FOR MEDICAL REASONS PER 100 MEDICAID ELIGIBLES, NEW MEXICO, 1971-1973

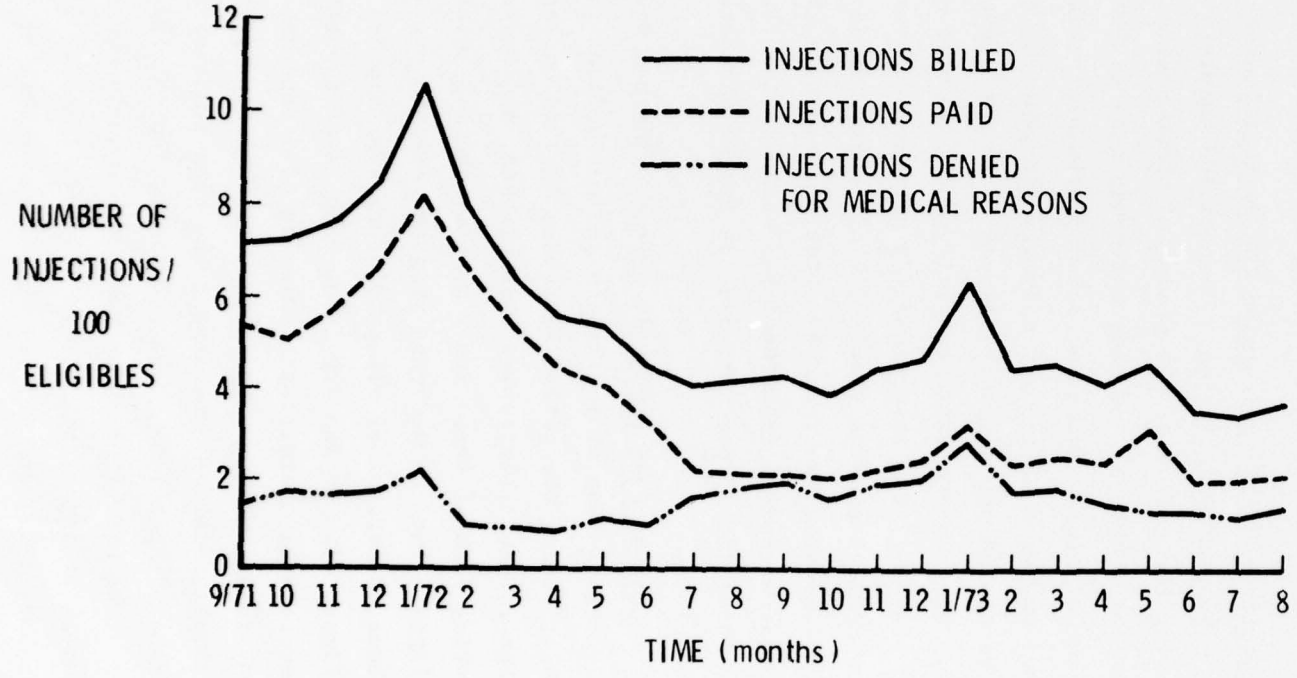
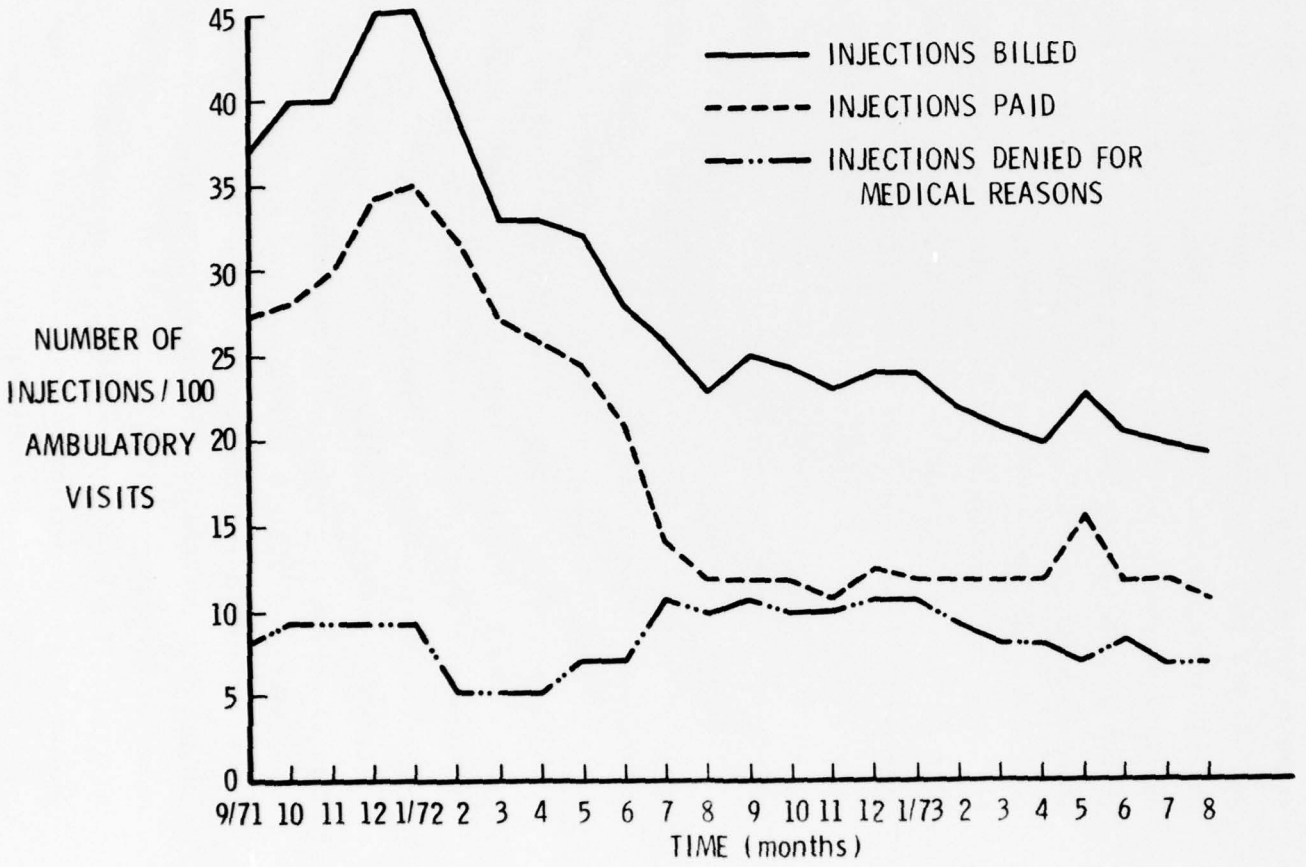


FIG. 2

NUMBER OF ALL INJECTIONS BILLED, PAID, AND DENIED FOR MEDICAL REASONS PER 100 AMBULATORY VISITS, NEW MEXICO, 1971-1973



It could be hypothesized that the use of all ambulatory services by the Medicaid population was falling rapidly during this period, and that the EMCRO did not cause this dramatic change in the use of injections. This hypothesis was not confirmed by the analysis of the use of other services reviewed only occasionally or not at all; during the same period, increases were seen in laboratory services (20 percent), prescription drugs (1.2 percent), and ambulatory visits (2.4 percent).

Thus, the New Mexico EMCRO had two outstanding features with respect to injections. First, it prevented almost 45,000 unnecessary injections, thus forestalling iatrogenic disease due, for instance, to inappropriate use of antibiotics. Second, by the end of the study period, it was denying payment on medical grounds for 40 percent of the injections still being given.

Classes of Injections. The use of different types of injections (e.g., lincomycin, gold, Vitamin B_{12}) behaved differently during the study period. Types of injections were grouped into three classes depending on the behavior of the type of injection with respect to the number billed and the number denied. The first class of injections were those for which the billing per 100 eligibles decreased remarkably over time and for which the proportion of injections denied rose substantially. Twelve different types of injections fell into Class I (see Table 1). This class includes principally the antibiotics other than benzathine penicillin G (Bicillin), the steroids other than triamcinolone acetonide (Kenalog), and female hormone preparations. The pattern for the use of this type of injection was typified by lincomycin: the number of injections billed per 100 eligibles (Figure 4) dropped from 1.7 in January 1972 to 0.07 in August 1973; the percent of injections denied per injections billed rose from 18 to 85 percent (Figure 3). Payment was denied for 75 per-

FIG. 3

PERCENT OF INJECTIONS DENIED FOR MEDICAL REASONS PER INJECTION BILLED, NEW MEXICO MEDICAID ELIGIBLES, 1971 - 1973

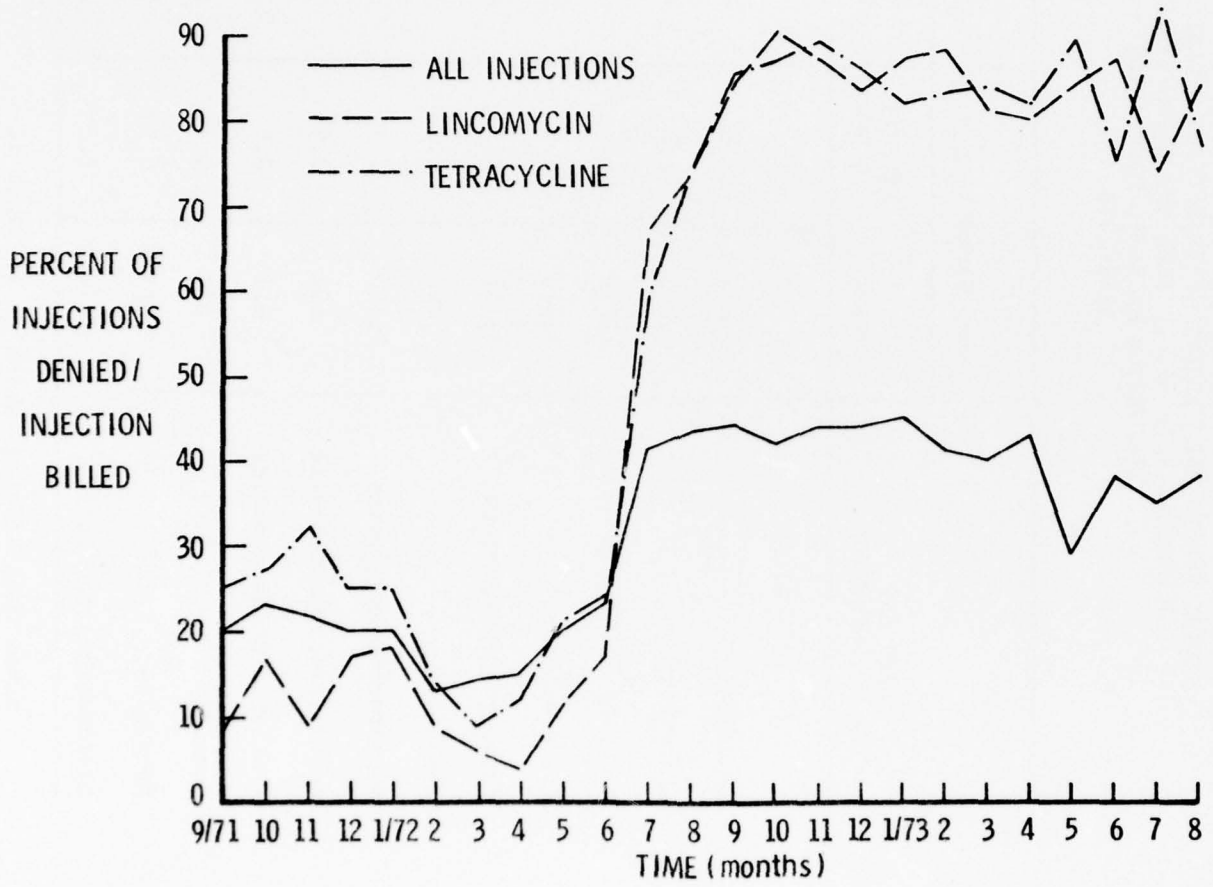


Table 1

TOTAL NUMBER AND PERCENT OF INJECTIONS BILLED AND DENIED FOR MEDICAL REASONS, BY TYPE AND CLASS OF INJECTION
NEW MEXICO MEDICAID POPULATION
1971-1973

CLASS AND TYPE OF INJECTION	INJECTIONS BILLED		DENIED FOR MEDICAL REASONS	
	NUMBER	PERCENT (COLUMN)	NUMBER	PERCENT[f] (ROW)
CLASS I				
Penicillin	22,538	23.6	5,675	25.2
Lincomycin	9,371	9.8	2,706	28.9
Steroids[*]/ACTH	5,704	6.0	2,696	47.3
Tetracycline	3,412	3.6	1,388	40.7
Estrogen/Progesterone	3,115	3.3	1,934	62.1
Ampicillin	1,800	1.9	463	25.7
Nonnarcotic Analgesics	1,306	1.4	465	35.6
Antibiotic/Nonantibiotic	908	0.9	260	28.6
Synthetic Antispasmodics	811	0.8	109	13.4
Gomenol	672	0.7	456	67.9
Diuretics	515	0.5	171	33.2
Antibiotic/Antibiotic	78	0.1	31	39.7

[*] Other than Kenalog, which is in Class II

[f] Percent of injections billed

Table 1 - Continued

CLASS AND TYPE OF INJECTION	INJECTIONS BILLED		DENIED FOR MEDICAL REASONS	
	NUMBER	PERCENT (COLUMN)	NUMBER	PERCENT[f] (ROW)
CLASS II				
Tranquilizers	3,785	4.0	1,303	34.4
Narcotic Analgesics	2,950	3.1	729	24.7
Vitamin B_{12}	2,743	2.9	2,070	75.5
Antinauseants**	1,073	1.1	144	13.4
Antihistamines***	974	1.0	384	39.4
Kenalog	847	0.9	301	35.5
Iron	385	0.4	158	41.0
Other injections	15,253	16.0	4,381	28.7
CLASS III				
Bicillin	8,221	8.6	1,255	15.3
Tetanus	3,094	3.2	30	1.0
DPT, Flu, Gamma Globulin	2,743	2.9	101	3.7
Compazine	1,780	1.9	184	10.3
Phenergan	804	0.8	216	26.9
Gold	693	0.7	28	4.0
Total	95,575	100.1	27,638	28.9

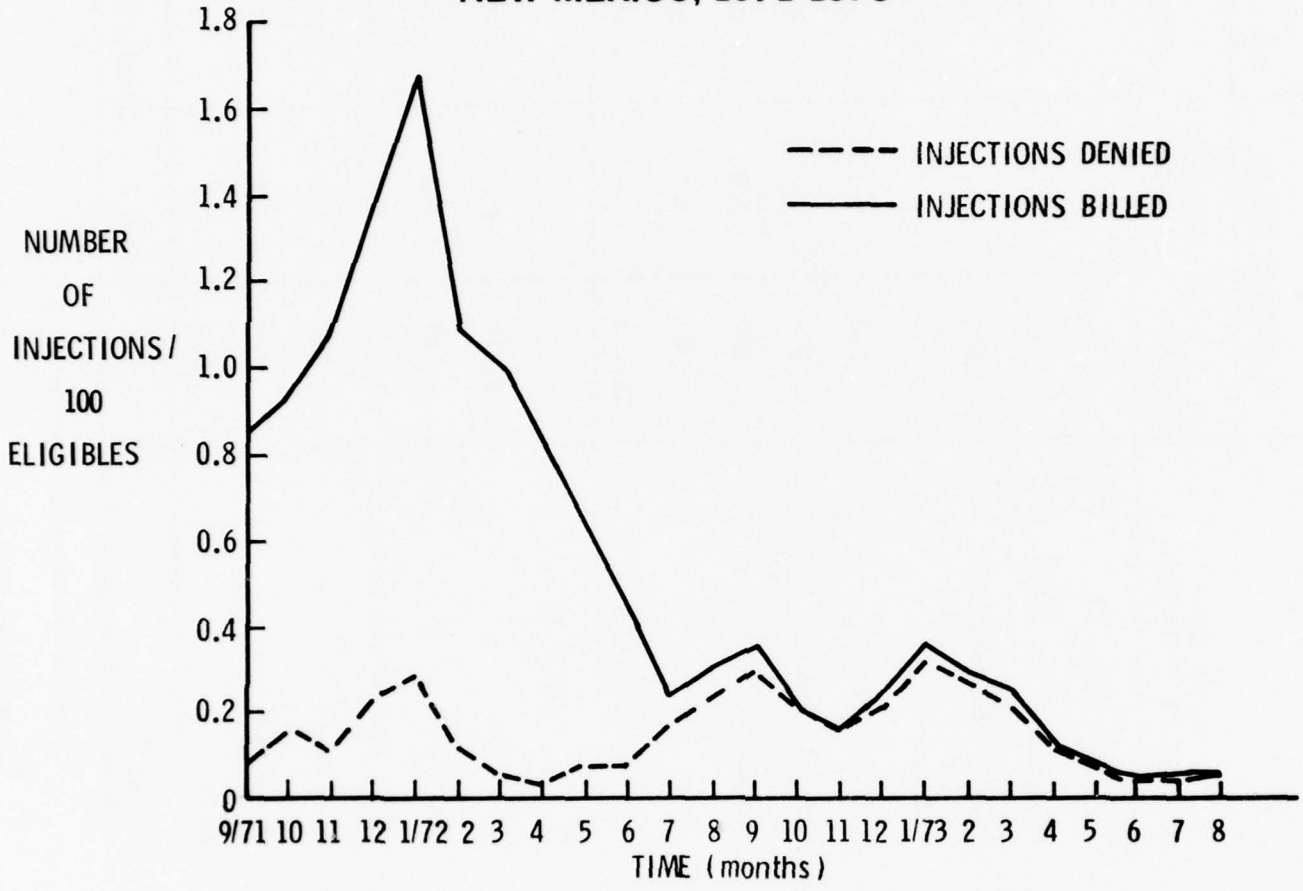
[f] Percent of injections billed

** Other than Compazine, which is in Class III

*** Other than Phenergan, which is in Class III

FIG. 4

NUMBER OF INJECTIONS OF LINCOMYCIN BILLED AND DENIED FOR MEDICAL REASONS PER 100 MEDICAID ELIGIBLES, NEW MEXICO, 1971-1973



cent or more of the following injections for at least half or more of the study period: lincomycin, tetracycline, antibiotic-antibiotic combinations, antibiotic-nonantibiotic combinations, ACTH, estrogen, and injectable expectorant (Gomenol). Since many injections included in Class I, especially the antibiotics, can have severe side effects, the marked decline in the inappropriate use of these injections as judged by medical criteria was "clinically" significant, insofar as potentially harmful side effects were avoided.

Class II injections were characterized by those types of injections with a fairly high denial rate but little or no net change in the billing rate during the two years of the study period. Eight types of injections fell into this category (see Table 1). Although this class overlaps with Class I for steroids and analgesics, it is composed chiefly of tranquilizers, an occasional antihistamine preparation, and iron and Vitamin B_{12} preparations. Some of these injections are placebos; although payment for them could be denied, it apparently was difficult to prevent them from being used as such. For instance, over 75 percent of all Vitamin B_{12} injections were denied on medical grounds, but its use continued to rise slightly.

In Class III, the number of injections billed rose over time and the denial rate was low. Six types of injections were included in this class (see Table 1). The immunizations, most of which were tetanus given for acute problems, were prominent. The injection policy of this EMCRO was intended to encourage the use of long-acting antibiotics when treating conditions such as streptococcal pharyngitis. Apparently this was accomplished, as judged by the increased use of benthazine penicillin G for this condition. Gold, which is used in the treatment of rheumatoid arthritis, can be given only by injection; the pattern for gold injections billed and denied indicates that it was being given appropriately for that diagnosis. Finally, promethazine hydrochloride (Phenergan) and prochlorperazine (Compazine) seem to be the therapies of choice by New Mexico physicians for their respective conditions. These two drugs had a low denial rate and the number of these injectables billed increased slightly during the study period. On the basis of the types of

injections included in Classes I, II, and III, it can be concluded that peer review decisions were made rationally and selectively.

The Relationship of Injection Utilization and Denial to Physician Characteristics

Data in Tables 2-5 summarize the relationship between some physician characteristic factors and utilization and denial of injections. The three major dependent variables are injections billed per ambulatory visit, injections denied per ambulatory visit, and injections denied per injections billed. Because of the large numbers, virtually all categories of the physician characteristics are significantly related to the dependent variables.

Provider Type. Provider type had a major effect on the proper use of injections, in that the dependent variables were all very much lower for groups than for either MDs or DOs (Table 2). In particular, the injection denial rate per visit for groups was one-quarter the rate for the DO population; the denial rate per injection billed for groups was two-thirds the rate for DOs. The rate of injections billed per ambulatory visit for MDs was three-fifths that for DOs; their denial rate per visit was not quite two-thirds the DO rate.

Age. It had been hypothesized that older physicians would use more injections and would have a higher percentage of their injections denied for medical reasons. In general, this hypothesis was not confirmed, although the age effect was complex (Table 3). Very young MDs ($\leq$34 years of age), numbering only six in the sample, used injections more inappropriately than did any other MDs, including those 65 and older. MDs 35 to 44 years of age used injections most appropriately. DOs less than 45 used injections more appropriately than did those 45 and older.

County of Practice. It had been hypothesized that physicians in all rural areas of the state would have a less acceptable level of medically appropriate injections than physicians in the more urban areas. This hypothesis was not confirmed. Physicians in the semi-urban and semi-rural areas appeared to practice the best medicine. For example, the number of injections denied per ambulatory visit was

Table 2

APPROPRIATENESS OF THE USE OF INJECTIONS BY PROVIDER TYPE
NEW MEXICO MEDICAID POPULATION, 1971-1973

Provider Type	Number				*Injections Billed per Ambulatory Visit	*Injections Denied per Ambulatory Visit	*Injections Denied per Injections Billed
	Providers	Ambulatory Visits	Injections Billed	Injections Denied			
M.D.	232	118,354	24,728	8,149	0.21	0.07	0.33
D.O.	81	100,632	35,849	10,949	0.36	0.11	0.31
Groups†	47	77,207	10,606	2,071	0.14	0.03	0.20
Total	360	296,193	71,183	21,169	0.24	0.07	0.30

*Chi square significant at ≤ 0.05

†Groups comprised only M.D.s

Table 3

APPROPRIATENESS OF THE USE OF INJECTIONS BY PROVIDER TYPE AND PROVIDER AGE
NEW MEXICO MEDICAID POPULATION, 1971-1973

Provider Type and Provider Age	Number of Providers	Number of Ambulatory Visits	Number of Injections Billed	Number of Injections Denied	*Injections Billed per Ambulatory Visit	*Injections Denied per Ambulatory Visit	*Injections Denied per Injections Billed
M.D.							
≤ 34	6	3,406	1,299	646	0.38	0.19	0.50
35-44	75	40,492	5,098	1,364	0.13	0.03	0.27
45-54	62	27,940	5,893	1,581	0.21	0.06	0.27
55-64	52	30,949	7,525	2,141	0.24	0.07	0.28
≥ 65	22	10,085	2,306	1,449	0.23	0.14	0.63
Subtotal	217	112,872	22,121	7.181	0.20	0.06	0.32
D.O.							
≤ 34	13	14,265	2,765	459	0.19	0.03	0.17
35-44	11	22,385	5,571	1,209	0.25	0.05	0.22
45-54	19	29,942	13,819	4,398	0.46	0.15	0.32
55-64	22	20,792	9,496	3,326	0.46	0.16	0.35
≥ 65	13	11,867	3,411	1,434	0.29	0.12	0.42
Subtotal	78	99,251	35,062	10,826	0.35	0.11	0.31
Total	295	212,123	57,183	18,007	0.27	0.08	0.31

*Chi square significant at ≤ 0.05

0.05 and 0.06, respectively, for the semi-urban and semi-rural areas, compared with 0.09 and 0.12, respectively, for the urbanized center and the rural areas. No consistent relationship was found between location of practice *vis-à-vis* urban and rural areas and the three dependent variables.

Specialty. Most providers could be classified into one of the traditional five major specialties (internal medicine, pediatrics, general practice, obstetrics-gynecology, and general surgery). Data on this factor (controlling for provider type) indicated that the MD pediatricians were exemplary physicians and that the DO obstetrician-gynecologists had the worst record in the use of injections (Table 4). MD internists had a slightly lower denial rate per visit than did general practitioners (0.06 versus 0.07), but they also had a higher percentage of their injections denied per injection billed than did the general practitioner (0.36 versus 0.30).

Specialty Board Certification. The relationship between board certification status and the appropriateness of the use of injections was also examined. Data referred only to those physicians who had obtained certification by one American specialty board *vis-à-vis* those physicians who had not. It had been hypothesized that board certification status would be strongly related to the appropriate use of injectable drugs, and in fact this was confirmed (Table 5). Noncertified physicians (both DOs and MDs) used more injections, had more injections denied for medical reasons, and had a higher percentage of their injections denied. In the case of the number of injections denied per ambulatory visit, the value was threefold higher for the noncertified DO than for his certified colleague; the respective difference for MDs was fourfold.

Figure 5 highlights the differences in injections billed by physician type and board certification status. The number of injections billed per ambulatory visit declined markedly for all four categories of physicians, beginning in January 1972. Similarly, the number of injections billed that were subsequently denied increased for all classes of physicians after May 1972. At the start of the study, the number of injections denied per injection billed was between 0.15 and

Table 4

APPROPRIATENESS OF THE USE OF INJECTIONS BY PROVIDER TYPE AND SELECTED SPECIALTIES
NEW MEXICO MEDICAID POPULATION, 1971-1973

Provider Type and Specialty	Number of Providers	Number of Ambulatory Visits	Number of Injections Billed	Number of Injections Denied	*Injections Billed per Ambulatory Visit	*Injections Denied per Ambulatory Visit	*Injections Denied per Injections Billed
M.D.							
Internal medicine	31	16,106	2,683	963	0.17	0.06	0.36
Pediatrics	23	11,104	1,501	154	0.14	0.01	0.10
General Practice	81	61,566	14,403	4,356	0.23	0.07	0.30
OB-Gyn	16	3,580	444	194	0.12	0.05	0.44
Surgery	61	18,227	3,627	1,610	0.20	0.09	0.44
Subtotal	212	110,583	22,658	7,277	0.20	0.07	0.32
D.O.							
Internal medicine	2	1,524	111	17	0.07	0.01	0.15
Pediatrics	2	2,586	570	133	0.22	0.05	0.23
General practice	45	70,001	23,174	6,330	0.33	0.09	0.27
OB-Gyn	10	9,985	5,721	2,295	0.57	0.23	0.40
Surgery	15	12,919	4,436	1,272	0.34	0.10	0.29
Subtotal	74	97,015	34,012	10,047	0.35	0.10	0.30
Total	286	207,598	56,670	17,324	0.27	0.08	0.31

*Chi square significant at ≤ 0.05

Table 5

APPROPRIATENESS OF THE USE OF INJECTIONS BY PROVIDER TYPE AND BOARD CERTIFICATION STATUS
NEW MEXICO MEDICAID POPULATION, 1971-1973

Provider Type and Certification	Number of Providers	Number of Ambulatory Visits	Number of Injections Billed	Number of Injections Denied	*Injections Billed per Ambulatory Visit	*Injections Denied per Ambulatory Visit	*Injections Denied per Injections Billed
M.D.							
Noncertified	124	77,913	17,628	5,882	0.23	0.08	0.33
Certified	90	33,180	3,607	742	0.11	0.02	0.21
Subtotal	214	111,093	21,235	6,624	0.19	0.06	0.31
D.O.							
Noncertified	69	88,399	32,880	10,415	0.37	0.12	0.32
Certified	9	10,852	2,182	411	0.20	0.04	0.19
Subtotal	78	99,251	35,062	10,826	0.35	0.11	0.31
Total	292	210,344	56,297	17,450	0.27	0.08	0.31

*Chi square significant at ≤ 0.05

0.25 for the four classes of physicians. After May 1972, the figure jumped to about 0.55 for noncertified DOs and MDs and to not quite 0.35 for certified physicians.

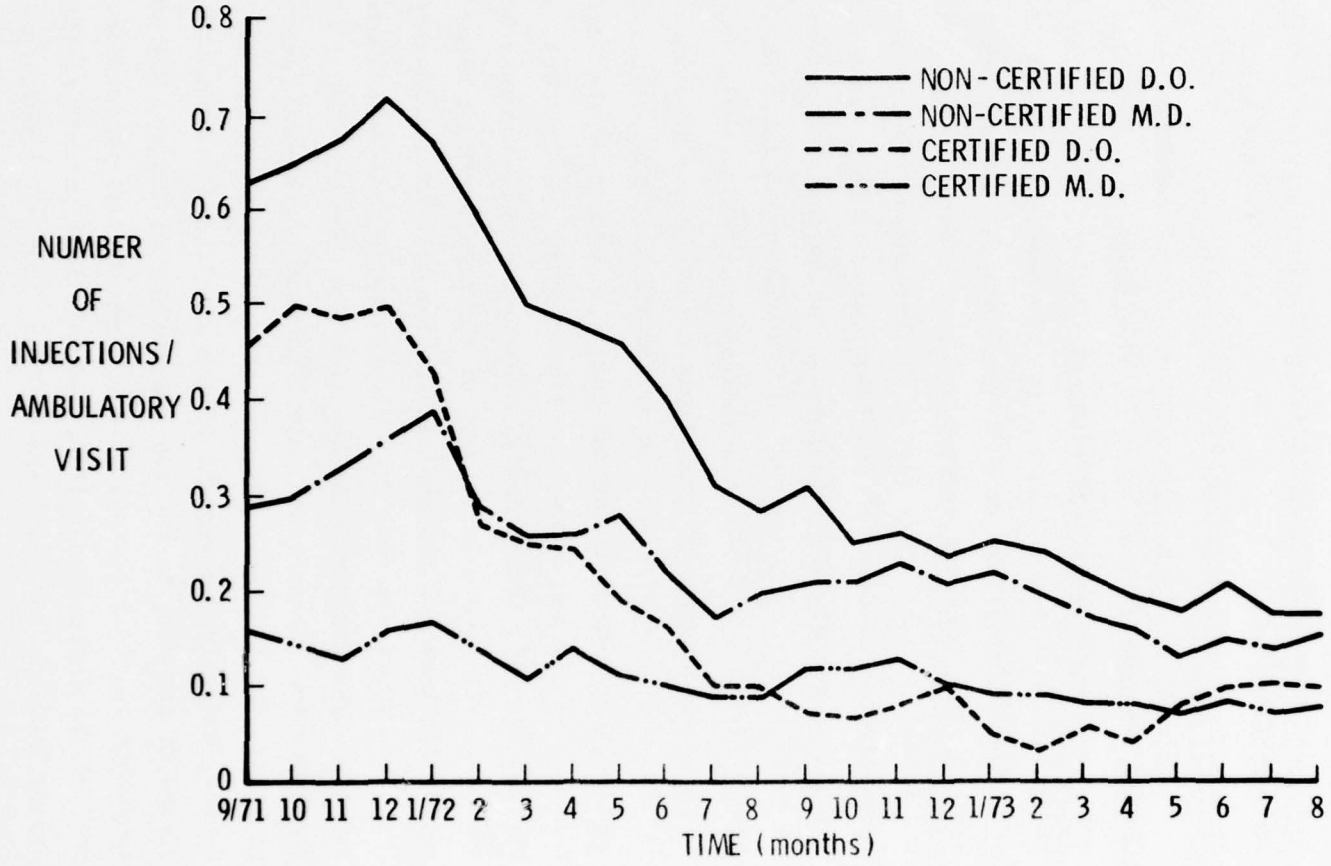
Certain trends are apparent from these data and from Figure 5. In the "before" period (9/71 to 1/72), the DOs (both certified and noncertified) used injections more inappropriately than did either MD group. In the "after" time period, however, the noncertified DOs began to behave more like their noncertified MD counterparts than like their certified DO colleagues. Similarly, the certified DOs began to practice more like their certified MD colleagues. Thus, in the "before" period, the more important explanatory variable (of the two under discussion) was provider type; by the end of the study period, it was board certification status.

Foreign and U.S.-Educated Physicians. The last analysis concerned only MDs and related country of medical graduation to the dependent variables. It had been hypothesized that foreign medical graduates (FMGs) would have a higher incidence of inappropriate use of injections than would U.S. medical graduates (USMGs). The data confirmed this difference, but it was not a particularly striking one. For example, USMGs had a billed per visit rate of 0.19, and (non-Canadian) FMGs had a rate only slightly higher, 0.22. Similarly, the denied per visit rate for USMGs was 0.06 and 0.08 for FMGs; the rate of injections denied per injection billed was 0.31 and 0.36 for USMGs and FMGs, respectively. Thus, the hypothesized effect of a much higher rate of denial for FMGs than for USMGs was not found in this study.

Summary of the Contingency Table Analysis. Two major hypotheses were substantiated by this analysis: DOs had a higher rate of inappropriate use of injections than did MDs, and non-board-certified physicians had a higher rate of inappropriate use than certified physicians. By the end of the study, the latter effect predominated. Two hypotheses were not supported. Although USMGs had a slightly lower rate of inappropriate use of injections than did their FMG counterparts, the difference was not impressive (and was not statistically significant in the multivariate regression analyses). Similarly, the inappropriate use of injections increased with age in the DO popula-

FIG. 5

NUMBER OF INJECTIONS BILLED PER VISIT BY PROVIDER TYPE AND PROVIDER BOARD CERTIFICATION STATUS (NEW MEXICO MEDICAID ELIGIBLES, 1971-1973)



tion, but the MD data suggested that the very young physicians used injections most inappropriately. Unexpected findings were that the MD pediatrician used injections most appropriately, that the DO obstetrician-gynecologists used injections most inappropriately, and that MD internists and MD general practitioners did not differ substantially in their use of injections.

The Outlier Physician. One additional question was explored, namely, whether a given class of physicians as a whole had a higher rate of inappropriate injections or whether, in contrast, only certain physicians within that class were responsible for the high rate.

The 360 providers were divided into the three provider classifications (MDs, DOs, and groups) and rank ordered by two variables: the number of ambulatory visits and the number of injections denied. Cumulative percentages of ambulatory visits, injections billed, and injections denied were calculated. Taking the rank order of ambulatory visits first, those MDs and DOs who gave a large number of ambulatory visits did not have a disproportionate number of injections, as measured by the rate of injections either billed or denied. The top 14 MDs, who gave 10.2 percent of the ambulatory visits, gave 8.5 percent of the injections and had only 8.9 percent of the injection denials. For the top 5 DOs, the figures were 10.7 percent, 11.6 percent, and 8.0 percent, respectively. Thus, one could conclude that those providers who gave a large part of the ambulatory services to this population were not responsible for the bulk of unnecessary injections.

When providers were rank ordered on injections denied, striking relationships emerged. The top five MDs, who produced 11.5 percent of the injections denied, had only 2 percent of the ambulatory visits. Likewise, the top three DOs, who gave 11.1 percent of the injections denied, had only 2.4 percent of the ambulatory visits. The 22 providers (6 percent) in the top two classes of MDs and DOs were responsible for 40.9 percent of the inappropriate injections, 29.0 percent of the injections billed, and only 13.5 percent of the ambulatory visits. Of the 360 providers studied, these 22 providers (6 percent) gave over 40 percent of the inappropriate injections in the Medicaid program. However, the outlier physicians changed their behavior sub-

stantially as a function of the peer review system; their injection patterns more closely resemble the injection patterns of their colleagues at the end of the study than at the beginning. In January, 1972, the outlier MDs gave 0.82 injections per visit, the outlier DOs gave 0.91, and all remaining physicians gave 0.32 injections per visit; respective values for August 1973 were 0.31, 0.49, and 0.19.

IV. DISCUSSION

This paper describes an evaluation of an *operational* quality assurance program that was shown to work. The New Mexico EMCRO was able to correct a substantial problem in the use of injections, through education of physicians who were using injections inappropriately and through denial of payment for services rendered. It seems clear that many iatrogenic complications (both local and systemic) in the use of injections in general and antibiotics in particular were prevented, through the elimination of over 60 percent of the injections in a two-year period. Moreover, virtually all physicians responded to this peer review system. Most impressive were the dramatic changes in the behavior of the 6 percent of physicians who were responsible for 40 percent of the inappropriate injections. No complex statistical analysis is needed to confirm the positive, clinically relevant effect that the EMCRO had on the quality of care given to Medicaid patients.

This assertion is tempered by the knowledge that improvement in the use of injections was the major (and perhaps the only clinically important) effect produced by the EMCRO in the first three years of its operation. If the PSRO model is eventually to prove successful in substantially improving the health of the American people, then the quality of care for other services must be measured and improved. Whether the New Mexico success can be replicated for other services in this and other states is not known. Nevertheless, efforts are warranted to determine if the improper use of injections exists in other population groups (not necessarily limited to Medicaid groups) in other states. If so, corrective steps similar to those employed by the New Mexico EMCRO should be implemented, at least on an experimental basis.

Those physicians who gave the most ambulatory services to this Medicaid population were not the ones who used injections most inappropriately; as judged by this criterion, they were not providing inferior care. Publication of the names of physicians who deliver the most Medicaid services often carries with it the implication that they are delivering inferior (or perhaps even fraudulent) care; the data re-

ported above, however, do not support this notion. In the absence of any other persuasive reason for such publication, therefore, the practice might usefully be stopped or curtailed unless future studies indicated that these physicians were indeed giving lower quality of care.[18]

The results of this study are limited in that they relate only to a few hundred physicians delivering care to the Medicaid population of one rural Western state. Nevertheless, a few important findings stand out. First, medical practice in a partnership, group, or clinic arrangement was the most significant variable in predicting the proper use of injections. Second, for individual providers, the most important variables in predicting appropriate use of injections were specialty board certification, provider type (being an MD), and specialty (being an MD pediatrician). Third, as judged by this one measure (proper use of injections), DO obstetrician-gynecologists and young MDs (less than 35 years of age) used injections quite inappropriately. Fourth, the care given by internists and general practitioners did not differ substantially. Fifth, foreign medical graduates did not give substantially worse care than did U.S. medical graduates. Sixth, site of practice (rural or urban) did not predict higher or lower quality of care.

Were these findings to be substantiated in different populations on larger, more representative samples, and using a greater variety of indicators of quality of care, reorientation of certain policies with respect to quality of health care might be in order. For example, attempts to require relicensure and recertification of older physicians should include efforts to upgrade qualifications for initial entrance to the practice of medicine. Major deficiencies exist in the quality of care provided and these seem not to be related to the acquisition of complex new knowledge. Thus, relicensure and recertification might be related, at least in the beginning, to the performance of relatively simple and basic medical practices and be directed at those providers who do not perform these activities well. Although much more study of the field is needed, relicensure that is focused principally on acquisition of new knowledge in, say, sophisticated therapeutic techniques, without addressing problems in basic medical care (such as injections), would seem to be misdirected.

The role of patient expectations in influencing physician decisions needs to be clarified. Insofar as patients do not expect injections for pediatric illnesses (immunizations excepted) but do expect injections for problems of old age or "female conditions," a bias for better or poorer quality of care being delivered by specialists concerned with one or the other of these population groups exists. There is a degree of patient responsibility--and need for patient education--that cannot be overlooked in this context.

Those features of the large group practices that encouraged the proper use of injections should be identified and, if possible, transferred to the solo fee-for-service setting. Since group practices had a better record than individual practitioners at the outset of the study as well as at the end, the EMCRO had relatively less impact in that setting; by implication, the group practice had certain intrinsic characteristics that promoted the more appropriate use of injectables. Whether this is an outcome related to characteristics of physicians within the group (e.g., specialty or board certification status) or to organizational and operational factors (or to a serendipitous combination of all these features) is a question worthy of substantial empirical investigation.

Finally, that this evaluation occurred at all must be emphasized. Its accomplishment required the cooperation of a Foundation for Medical Care, physicians, a fiscal intermediary, a state department of health, various government agencies, and a research organization--a combination rarely encountered in the past. Efforts at evaluating quality of care can generate a host of fears; leadership from many and diverse groups will be needed if evaluation of activities such as PSROs is to be successful. Without objective evaluation with appropriate feedback to the operational quality assurance agency, a quality assurance program like PSRO may fail to achieve its objective of improving the health of the American people. The successful collaboration represented by this study is a positive step toward that objective.

REFERENCES

1. Public Law 92-603, Social Security Amendments of 1972. 92nd Congress, 2d Session, United States Code. *Congressional and Administrative News* 1:1548-1747, 1972.

2. Public Law 93-222, Health Maintenance Organization Act of 1973. 93rd Congress, First Session, United States Code. *Congressional and Administrative News* 1:1015-1042, 1974.

3. Jacobs, C. M. and Jacobs, N.D. *The PEP Primer: The JCAH Performance Evaluation Procedure for Auditing and Improving Physician Care.* Chicago, Quality Review Center, Joint Commission on Accreditation of Hospitals, 1974.

4. Brook, R. H. A Skeptic Looks at Peer Review. *Prism* October 1974, pp. 29-32.

5. Jesse, W. F., Munier, W. B., Fielding, J. E., et al. PSRO: An Educational Force for Improving Quality of Care. *N Engl J Med* 292:668-671, 1975.

6. Sanazaro, P. J. Private Initiative in PSRO. *N Engl J Med* 293:1023-1028, 1975.

7. Willett, D. E. PSRO Today: A Lawyer's Assessment. *N Engl J Med* 292:340-343, 1975.

8. Roth, R. B. PSROs--Where are They Headed? What are the Problems? Presented at the Fall Meeting of the Institute of Medicine, National Academy of Sciences, Washington, D.C., November 6-7, 1974 (mimeographed).

9. Brian, E. Foundation for Medical Care Control of Hospital Utilization: CHAP--A PSRO Prototype. *N Engl J Med* 288:878-882, 1973.

10. Flashner, B. A., Reed, S., White, R., et al. The Hospital Admission and Surveillance Program in Illinois. *JAMA* 221:1153-1158, 1972.

11. Nelson, A. R. Relation Between Quality Assessment and Utilization Review in a Functioning PSRO. *N Engl J Med* 292:671-675, 1975.

12. Buck, C. R., Jr., and White, K. L. Peer Review: Impact of a System Based on Billing Claims. *N Engl J Med* 291:877-883, 1974.

13. United States Department of Health, Education, and Welfare. *EMCRO Program.* (DHEW Publication No. [HSM] 73-3017) Washington, D.C., Government Printing Office, 1973.

14. Sanazaro, P. J., Goldstein, R. L., Roberts, J. S., et al. Research and Development in Quality Assurance. The Experimental Medical Care Review Organization Program. *N Engl J Med* 287:1125-1131, 1972.

15. Goldstein, R. L., Roberts, J. S., Stanton, B. A., et al. Data for Peer Review: Acquisition and Use. Results in the Experimental Medical Care Review Organization Program. *Ann Intern Med* 82:262-267, 1975.

16. New Mexico Experimental Medical Care Review Organization, *Professional Review for the New Mexico Medicaid Program*, Vols. 1 and 2. Albuquerque, New Mexico, The Dikewood Corporation, May 1973.

17. Brook, R. H. and Williams, K. N. *Evaluation of the New Mexico Peer Review System, 1971 to 1973.* R-2110-HEW/RC. Santa Monica, California: The Rand Corporation, 1977. Also published in *Medical Care* 14 (Supplement): December 1976.

18. Medicaid Paid $100,000 or More to 42 Firms, Doctors in Maryland. *The Baltimore Sun*, p. C 16, Tuesday, November 9, 1976. This news report is an example of the danger of "guilt by implication" with respect to high Medicaid fees. Of the six group practices cited, three were made up of highly-qualified physicians at nationally-recognized teaching hospitals that deliver the great bulk of care to inner-city residents.